

Grazing

1992

During 1992, co-op farmers used two tracts of ground totaling 112 acres for grazing. This practice was done to ease the transformation from agriculture and eliminate some undesirable species from the restoration project.

1993

There was one Cooperator grazing cows and calves on two units in 1993. The units totaled 95 acres and were moderately grazed from early summer through November. Fees were based on Jasper County Extension Office figures.

There is no grazing planned in 1994. In the future, small units may be grazed for vegetation manipulation under tightly controlled parameters.

1995

We permitted the grazing of 20 acres of corn stubble. This was a newly acquired parcel of ground on which grazing had been allowed previously.

1996/7

Grazing on Walnut Creek took on a new meaning this year with the release of 14 head of bison in 1997. These new Refuge tenants will have grazing privileges on 740 acres composed of native grasses, forbs, and cool season grasses.

Haying is not normally a permitted Refuge activity. However, in special cases we have allowed this activity to take place. During 1996, as a part of a management strategy for the native restoration, the Refuge hayed approximately 89 acres. These areas were hayed to remove a heavy growth of cool season grass. Bales taken from haying went in part to the cooperator who did the haying and in part to the Refuge.

1999

There is no grazing or haying to report. However, mowing plays an integral part at Neal Smith NWR. Mowing takes place as a first and second year management tool on new prairie plantings. Also, mowing is used to control broadleaf weeds and woody vegetation

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to promote native growth. Approximately 1,000 total acres were mowed in FY99, consisting of prairie plantings, firebreaks, demolition sites, and weed management sites.

2000

Our bison population increased to 53 animals, as a result of 13 births and 2 deaths. These herds are on a continuous grazing regime within a 750 acre enclosure which is estimated to produce approximately 1,125,000 - 1,500,000 pounds of forage annually. Combined forage consumption by the animals is estimated to be no more than 450,000 pounds each year. The newly established prairie within the enclosure is capable of sustaining the current herd size at a 35 to 40% utilization rate, without slope corrections. Bison herd reductions will be made in 2001 and as needed to prevent habitat damage while still playing a vital role in the establishment and ecology of the prairie.

The Refuge currently supports 13 elk. During Spring 2000, radio collars were removed from 2 of the bull elk initially introduced to the Refuge. Of interest in the second event was the fact that after several hours of chase, the animal finally was successfully sedated and went down between two segments of the bison herd. The bison surrounded the elk and provided some challenge to Refuge staff and to the veterinarian who were attempting to remove the collar and revive the animal. Staff responded well, however, and the elk was up and running soon thereafter.

2001

The Refuge is currently able to support 35 head of bison and 15 elk within its 750 acre enclosure. These herds are on a continuous grazing regime and the enclosure is estimated to produce approximately 1,125,000 to 1,500,000 pounds of forage annually. Combined forage consumption by the animals is estimated to be no more than 450,000 pounds each year. The newly established prairie within the enclosure is barely capable of sustaining the current herd size at a 35 to 40% utilization rate, without slope corrections. Bison herd reductions will be made in October, 2001 and as needed each year to prevent habitat damage while still playing a vital role in the establishment and ecology of the prairie.

2002

A bison roundup was conducted at the end of October 2001 with 64 of 70 animals captured. All animals were checked for general health condition and common bovine diseases. Blood was drawn from each animal to monitor the genetic structure of the herd. Loren Clary, Bob King and "Skip" Palmer from the National Bison Range came to the Refuge with their trusty steeds and gave us a hand in the roundup. Their expertise on

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horse back was invaluable. Dr. Tom Roffe, DVM from USGS at Montana State University, assisted by Dr. Tim Yoder, a local veterinarian, collected blood for genetic data and gave the animals a general physical. The bison were tested for various common bovine diseases.

We learned a great deal this year and think we will be much more prepared next year. Thirty-six animals were culled from the herd. One bull was put down after it was gored by another bull while moving the animals through the chutes. Four animals were donated to local County Conservation Boards for educational purposes. Sixteen were donated to the Winnebago Tribe of Nebraska and another 16 to the Red Lake Band of the Chippewa in northern Minnesota. The herd size was reduced to 33 head.

The Refuge is currently able to support 35 head of bison and 15 elk within its 700 acre enclosure. These herds are on a continuous grazing regime which is estimated to produce approximately 1,125,000 to 1,500,000 pounds of forage annually. The newly established prairie within the enclosure is capable of sustaining the current herd size at a 35 to 40% utilization rate, with a 30% slope correction. Bison herd reductions will be made each year as needed to prevent habitat damage while allowing the bison to continue playing a vital role in the establishment and ecology of the prairie.

2004

Effects of grazing mammals on tallgrass prairie restorations - Principal Investigator: Brian Wilsey; Graduate Research Assistant: Leanne Martin, Department of Ecology, Evolution and Organismal Biology, Iowa State University, Ames, IA

The presence of bison and prescribed fire, as well as the relatively large size of the reconstructed prairie at Neal Smith National Wildlife Refuge makes it an excellent site to test hypotheses concerning prairie restoration success. Our research project at NSM has two primary objectives: 1) to identify whether various aspects of plant diversity and ecosystem functioning have been restored successfully, and 2) determine how bison grazing is impacting plant diversity and ecosystem functioning of restorations.

The first part of our project was designed to quantitatively compare plant diversity and net primary productivity (NPP) between prairie plantings at NSM and nearby remnants (reference prairies), and to collect time 0 data for the second part of our project (see below). Plots of 6 x 8 m were established within eight plantings at NSM and within three nearby reference prairies (Sheeder Prairie, Rolling Thunder Prairie and A.C. Morris Prairie, eight plots per remnant). Quadrats (0.4 m²) were clipped during 2002 and 2003 within each of the eight plantings and the three remnants. This gave us eight plots north of the visitor road (planted with prairie mix plus six lbs/acre of Canada wildrye) and eight to the south (planted with prairie mix only). Above ground material was sorted into live and dead components, and live biomass was sorted by species, dried and weighed. Mean plant species richness, evenness, and overall diversity, and the proportion of native and

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exotic species were calculated at the quadrat (plant neighborhood) scale. An estimate of proportion of beta diversity (amount of "patchiness") was made by comparing mean quadrat-level estimates to estimates for the entire site. Within NSM, species evenness and diversity was higher and species richness was similar in plantings north of the road, where a cover crop was used, than in plantings south of the road, where a cover crop was not used. There were large differences in quadrat-scale species richness and the proportion of beta diversity between NSM and remnants. However, there were no significant differences in species evenness. These results suggest that large differences remain in the number of species and the patchiness of species between the prairie plantings at NSM and remnants. Seed addition studies (part 2) are in progress to determine if diversity can be increased by adding seed (i.e. if it is limited by the availability of seed).

The second part of our project was designed to determine if bison grazing is affecting plant diversity, NPP, proportion of grass and exotic species, and seedling establishment. In June 2003, a bison exclosure (8 x 6 m) was built within each of the eight plantings at NSM. Within each planting, there are also two adjacent 8 x 6 m plots that were left open to bison activities. Seeds of ten rare plant species, including forbs, legumes, and grasses, were added to 1 x 1 m subplots within each of the plots in June 2003 and twenty-five species were added to an additional set of subplots in spring 2004 to repeat the experiment. Plots of the same size were established nearby to serve as controls for the seed addition. Seedlings were counted monthly in each of the plots for the remainder of the 2003 growing season (first seed addition) and in the 2004 growing season (first and second seed addition). Light availability and soil water were also measured to determine if grazing affects these variables that are so important to seedling establishment. Because the amount of grazing varies from site to site, and because this variation is important in predicting responses, we also estimated bison consumption rates by comparing biomass inside and outside of temporary exclosures. NPP was estimated as the amount of biomass accumulation plus the amount consumed by bison, and grazing intensity as $(\text{consumption}/\text{NPP}) \times 100$. Temporary exclosures were constructed in March 2004 and moved in June 2004, and biomass was clipped in June and August 2003, and in March, June, and August 2004.

Net primary production did not vary with grazing during June-August 2003 and April-June 2004, but was significantly greater in the grazed treatment during June-August 2004 after adding consumed biomass. Light availability was consistently higher in grazed plots than inside exclosures. Grazing intensity varied between June-August 2003 (mean GI: 49% of productivity consumed) and April-June 2004 (14%) and was highest in June-August 2004 (68%). Preliminary analyses indicate that species diversity measures did not differ between grazed and ungrazed plots. Neither the proportion of exotic species nor the proportion of C4 grasses differed between treatments. Seed addition analyses are ongoing. The large variability in grazing intensities suggests that establishment of seedlings may be patchy, and may occur only where grazing has optimized establishment conditions. Therefore, analyses of light, water and biomass variability in grazed versus ungrazed areas are ongoing.

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Results from these two studies will help identify how well different components of ecosystem functioning and plant diversity have been restored. Also, as bison and other grazing mammals are more commonly reintroduced as part of restorations, it will be important to know what effects they are having. Knowledge from these studies will hopefully be helpful to management of prairies at this and other locations.

2006

August 2006

Viste-Sparkman attended a conference on grazing native plants in Ames on August 10. This was followed up by a visit to the Refuge by range ecology experts Dr. Dave Engle and Ryan Harr of the ISU Department of Natural Resource Ecology and Management. They discussed forage availability and patch-burn grazing with Gilbertson, Drobney, and Viste-Sparkman. As a result of this meeting, in late August, Hager began mowing patches in the bison enclosure to improve foraging conditions, on the recommendation of Dr. Engle.

2007

April 2007

At the recommendation of Professor Engle of Iowa State University, the Refuge is experimenting with patch-burn grazing on the south side of the bison enclosure. A third or about 80 acres of the south side was burned this spring. An additional 80 acres will be burned in July and another in late fall.
